

not say that no one ever made money by pure science ; some men have done so, as is well known, by means such as telegraphic inventions and chemical processes applied to the arts ; but even these, and they are very few, have not become the millionaires, of whom not a small number are to be found amongst engineers and manufacturers. Putting aside these rare exceptions, science does not bring wealth to its cultivators. For instance, who ever made money by astronomy ? What did the discovery of Neptune, the highest scientific achievement of this age, bring to Professor Adams but tardy fame ? Are investigations of the properties of light, sound, gravity, magnetism, profitable pursuits ? Was the inventor of a new calculus ever made rich thereby ?

Shall we contend, therefore, that Government should supply the shortcomings of a scientific career, and place those who adopt it on a par pecuniarily with successful engineers ? By no means. We must look a little deeper for the reason why State should aid Science. We shall find, if we examine the whole domain of Science, that there are extensive tracts which require for their vigorous cultivation very costly appliances and a long expenditure of time. Poor men cannot afford the one at all, and cannot live if they devote themselves to the other without remuneration. Hence, if such branches of science do not receive aid from without, they must languish, if not be entirely neglected. But this cannot happen without depriving the community of some addition to its material advantages which it might otherwise possess. It is notorious, not, perhaps, to all the writers of the *Times*, but to those conversant with the state of science in England, that this evil is with us in full operation with constantly increasing force. Rich men do, it is true, sometimes devote themselves to science. But no individual can do more than labour during his lifetime ; and what is chiefly wanted now, in several of the most important lines of investigations, is uninterrupted continuity during immense periods of time. Will our friends, the Engineers, apply some of that "lavish liberality and unbounded enterprise," of which we have heard so much, in this direction ? We suppose not. Whatever may have been the love of knowledge for its own sake which distinguished the first founders of the profession, the modern "leading engineer" knows better than to put his money and time into so unprofitable a business.

England is at this moment behind every other civilised nation in the means afforded for the cultivation of those branches of science which do not yield immediate profit. But there are men, not connected with either the Government, the *Times*, or the Civil Engineer Institute, who are alive to the peril of prolonging this neglect, and who will not rest until they have opened the eyes of their countrymen to its imminence and magnitude, at present beyond the ken of their governors and their teachers. When they have attained their object, the *Times* will proffer them its aid.

THE ERUPTION OF MOUNT VESUVIUS

THE great eruption of Mount Vesuvius, with the telegraphic accounts of which the readers of the daily papers have been familiar for the past week, is undoubtedly one of the most considerable of modern times. Whether

the worst is yet over seems still uncertain while we are writing ; but even if this be the case, the mass of molten lava ejected, and the amount of damage done, will appear to bear comparison with those of almost any recent eruption. One account speaks of it as the grandest eruption since 1631.

The telegraphic accounts at present received are necessarily vague, and to a certain extent conflicting, and of course it is at present impossible to do more than chronicle. Scientific results must follow afterwards.

The correspondent of the *Daily News* says, under date of Sunday afternoon :—"I have just returned from visiting the spot where the victims of the eruption perished. Streams of lava, thirty metres wide and nearly ten metres in height, were still fiery and smoking. The detonations continue as before. Part of San Sebastiano is entirely destroyed, with everything near. King Victor Emmanuel and Signor Lanza were on the spot distributing money to the sufferers. All the people fled at the time, but some were beginning to return with their goods. The shower of cinders had ceased, the sky was blue, and Mount Vesuvius, with a colossal column of smoke above it, had a grandly imposing appearance."

San Sebastiano is a village on the north-western slope of Vesuvius, almost exactly in the direction of Naples. None of the earlier eruptions extended in this direction, but a stream of lava flowed almost close to the village in one of the early eruptions of this century. The lava is here spoken of as being sixteen feet deep in places, and in other despatches San Sebastiano and the neighbouring village of Masso di Somma are spoken of as having been nearly destroyed. This stream of lava is described as having several times changed its direction, and it is probably a branch of the same which has threatened Portici and Persina (no doubt Resina, almost close to Herculaneum) near the sea-coast, and caused the abandonment of these villages.

It must be a different stream which has partially or entirely destroyed Torre del Greco, one of the beautiful villages which lie on the shores of the Bay of Naples, in a south-westerly direction from the centre of the mountain. This village, or its immediate neighbourhood, has been overwhelmed several times within the last two centuries. The statement that "the lava now reaches from Torre del Greco to within five kilometres of the eastern coast, and threatens several other communes, the inhabitants of which have, in consequence, fled from their homes," is quite unintelligible.

The effect of the eruption at Naples up to Monday night is described as follows :—"Cinders fell all last night, and they still continue to fall at this moment as I send off the present despatch. A thin rain is also falling. Near Cercola the shower of scoriæ has compelled the soldiers to build huts in which they may obtain shelter. The church of San Giordano at Cercola has been destroyed. A number of people have been surrounded by the lava close to San Sebastiano. At Ottoiano a heavy shower of enormous blocks of lava has commenced. The railway is crowded with foreigners and Neapolitans hurrying away from Naples. A fresh eruption is feared, as loud explosions were heard last night even in this city."

The fall of cinders, even at Naples, is spoken of as so heavy that the sky seemed hidden by them, and they fell

everywhere like rain. The plantations were covered with them, and people were walking with umbrellas to protect themselves from the downpour. The rain of burning scorix has reached as far as Scafati and Palermo. Readers of Prof. Phillips's work on Vesuvius will recollect that he throws considerable doubt on the correctness of the popular idea that Vesuvius emits *flame* during an eruption, though he thinks there are one or two authentic instances of this rare phenomenon. The accounts at present received do not throw much light on this point. One narrator states "Mount Vesuvius is displaying terrible electric phenomena, marked by flashes of lightning and vibrations of the earth;" and another, that "flames are bursting through several craters." Other accounts speak merely of the eruption of glowing lava and smoke brightly illuminated by it, and this may readily have been mistaken for flame.

Great credit is due to Prof. Palmieri, who has remained at his post at the Observatory to watch the eruption, and from whose observations a great advance of science may be anticipated. On Monday at noon he telegraphed as follows:—"Scorix in great abundance have fallen in the direction of the Observatory. The instruments at the Observatory are very much disturbed. The projectiles from the volcano rise to a height of more than a kilometre. The lava has ceased to flow."

It is satisfactory to know that recent letters speak of the first reports of the loss of life as having been somewhat exaggerated. Eighty persons are now stated to be missing; all Italians. Thirteen wounded were taken to the hospital; of these six are dead. No English or Americans are reported dead or wounded.

The latest telegrams received at the moment of going to press speak of an enormous column of "fire" being visible from Naples. Explosions, accompanied by shocks like those of an earthquake, were constantly occurring. Prof. Palmieri telegraphed from the Observatory on Tuesday that the roar of the volcano had ceased. Numerous flaming projectiles continued to be launched into the air, but with less force than previously. The smoke had decreased, and the shocks, though frequent, were not of a dangerous character.

SCIENCE PRIMERS

Science Primers: "Chemistry," by Prof. Roscoe; "Physics," by Prof. Balfour Stewart. (London: Macmillan, 1872.)

THESE little books illustrate an imperfectly accepted truth, that systematic elementary teaching is a late and not an early product of educational energy. The best headmasters of our schools have discovered the fallacy latent in our ancient belief that the ablest men are required to teach the oldest boys, and have in one or two famous cases acted on their discovery. It is easy for a young man fresh from University honours to pour his knowledge into minds which have been well prepared, and which approach more or less to the level of his own; but to teach a class of little boys, to realise their difficulties and to appreciate their ignorance, to understand the perplexity which oppresses them in the presence of statements long since axiomatic to ourselves, requires a mature and versatile intelligence, a mind which can com-

municate childish knowledge as readily and as joyously as it solves recondite problems; a combination of rare gifts with long and conscientious training.

And thus it is that the zeal for scientific teaching and the gathered scientific experience of the last fifteen years have only issued now in the books which form the subject of our notice. Scientific class-books hitherto have been either too difficult or too easy. They have been unavailable for beginners without the intervention of a practical teacher; or in their effort to be popular and simple they have abdicated half their value as instruments of educational discipline. In these books both extremes are avoided. Every stage of their teaching is based upon experiment; no law is enunciated till it has been proved. From first to last the student finds himself in immediate contact with Nature. His empirical knowledge of external things is systematised; simple every-day phenomena reveal to him their principles and *rationale*; he walks forth with a new eye to discern the meaning and the beauty of familiar sights and sounds, and with a mind upon the stretch for fresh discoveries. And, on the other hand, no previous training is essential to the teacher who adopts them as his guide. Any man, ignorant even of the first principles of chemistry and physics, yet fairly dexterous and intelligent, who will patiently master the books, and try each experiment for himself, is in a position to transmit their contents successfully and clearly. The officer may lecture to the soldiers of his regiment, the clergyman to the artisans of his parish, the national schoolmaster to the children of his school. Managers of middle schools, deterred as yet from including science in their course through lack of teachers and of text-books, will find their difficulty removed. The higher schools need no longer confine their scientific teaching to the senior forms, but may place the "Science Primer" along with the Latin grammar, in the hands of their youngest boys.

The expense of apparatus need not be considered formidable. A complete set for the course of Chemistry is set down at 5*l.* 10*s.*, for Physics at 1*l.* 3*s.* 8*d.* This last, however, includes such costly implements as the air-pump, balance, Grove's battery, and electrical machine. Leaving these to be obtained by special donation or borrowed for the occasions of their use, and deducting such further instruments and utensils as a handy man can make or convert at trifling cost, the outlay for the two courses may be bought considerably under 10*l.* And since the apparatus once established will require rare and slight renewal, one may hope that a moderate number of pupils with a moderate scale of fees would always provide this sum, more especially if the South Kensington authorities, in the presence of these manuals and of the revolution they may be expected to work, can be induced to extend the limits under which they furnish educational materials at half-price.

The names appended to the books guarantee their scientific accuracy, and their embodiment of the latest knowledge; but from the teacher's point of view they exhibit some few statements which are not quite clear, and which may deserve reconsideration. In the Chemistry Primer (Experiment 3, p. 7) the caustic soda is left unsupported in the tube. The description is probably compelled to follow the engraving; but most lecturers would, as is suggested in the appendix, use the U tube in such a